



Fixpoints vs Moore Families

Zhang, Fuyuan; Nielson, Flemming; Nielson, Hanne Riis

Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):

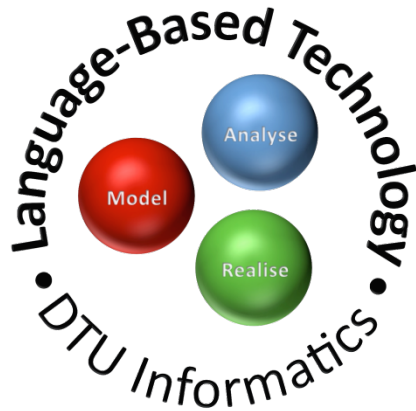
Zhang, F., Nielson, F., & Nielson, H. R. (2012). *Fixpoints vs Moore Families*. Poster session presented at 38th International Conference on Current Trends in Theory and Practice of Computer Science : Student Research Forum, Špindlerv Mlýn, Czech Republic.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



Fixpoints vs Moore Families

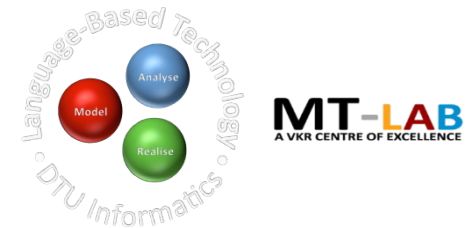
Fuyuan Zhang, Flemming Nielson, Hanne Riis Nielson

DTU Informatics, Technical University of Denmark

25th January 2012

MT-LAB
A VKR CENTRE OF EXCELLENCE

Background

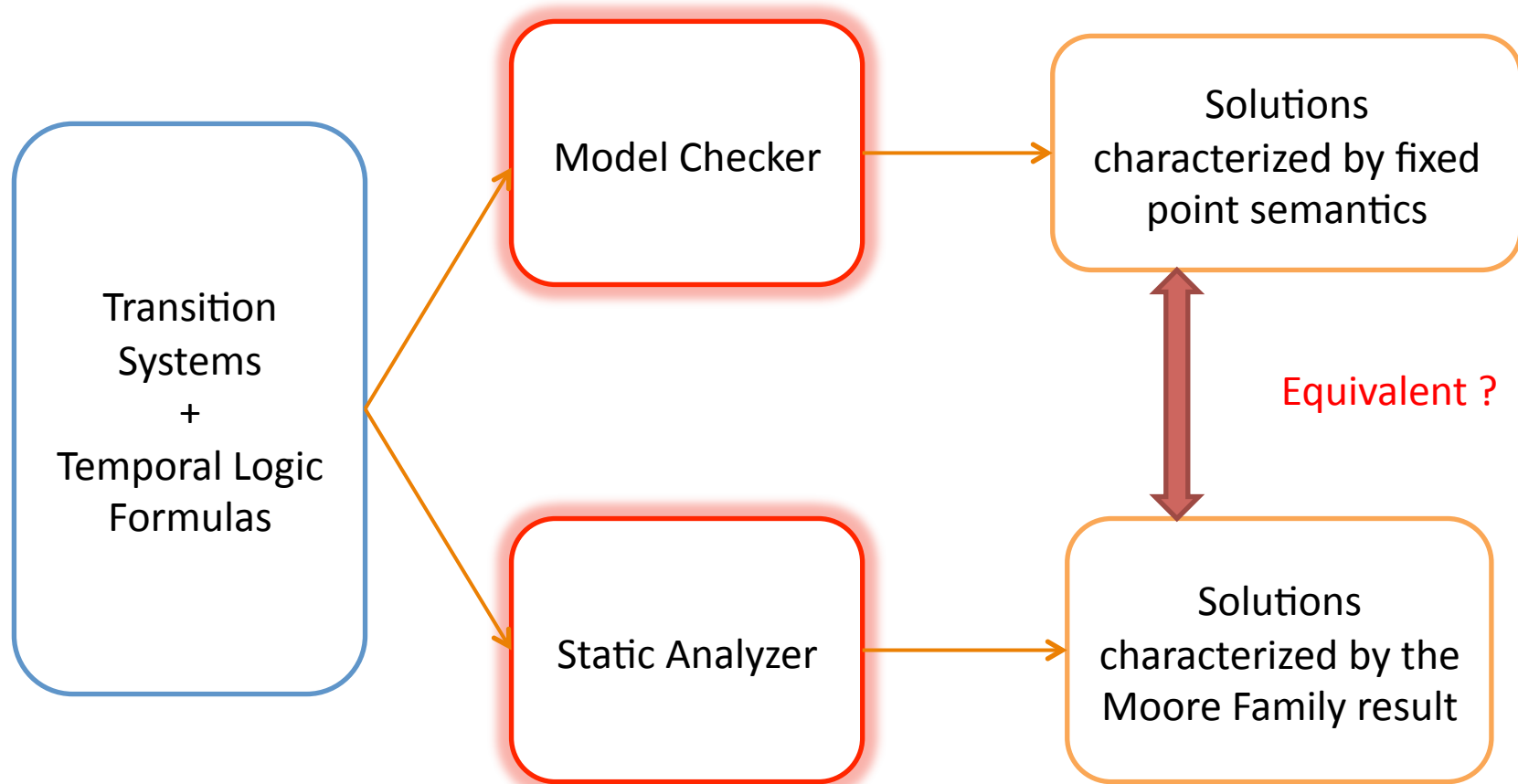
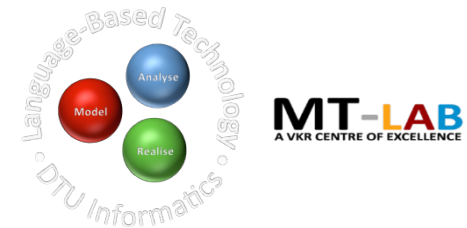


Model Checking vs Static Analysis

- Static analysis problems can be reduced to model checking.
 - Bernhard Steffen: Data Flow Analysis as Model Checking. *TACS 1991* : 346-365
 - Bernhard Steffen: Generating Data Flow Analysis Algorithms from Modal Specifications. *Sci. Comput. Program.* 21 (2): 115-139 (1993)
 - David A. Schmidt, Bernhard Steffen: Program Analysis as Model Checking of Abstract Interpretations. *SAS 1998* : 351-380
 - David A. Schmidt: Data Flow Analysis is Model Checking of Abstract Interpretations. *POPL 1998* : 38-48
- Model checking can be encoded in static analysis.
 - Flemming Nielson, Hanne Riis Nielson: Model Checking Is Static Analysis of Modal Logic. *FOSSACS 2010* : 191-205

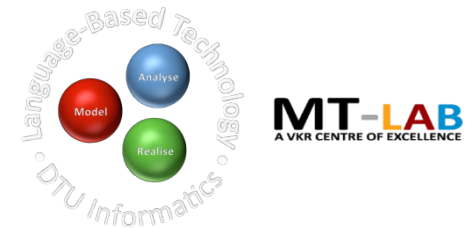
Fixpoints vs Moore Families

Model Checking vs Static Analysis



Setting the Scene

Model Checking vs Static Analysis



- Model checking for the μ -calculus:
 - The alternation-free fragment of the μ -calculus
 - The μ -calculus formulas of alternation depth n ($n > 1$)
- Alternation-Free Least Fixed Point logic (a logic approach to static analysis)
 - We use *stratification* to deal with negative uses of relations.
 - The Moore Family result: the set of solutions to an ALFP clause constitutes a Moore Family

Model Checking vs Static Analysis

- The alternation-free fragment of the μ -calculus can be encoded in ALFP.
 - The Moore family result makes use of a lexicographic ordering imposed by a suitable choice of ranking of the relations in the ALFP formula.
 - The set of states of a formula that make it true over a given Kripke structure is described as the least element in a Moore family of acceptable sets of states for the static analysis.
- It's not feasible to encode the μ -calculus formulas of alternation depth n ($n > 1$) into ALFP in a similar way.
 - It's interesting to identify fragments of the μ -calculus that reside properly between alternation depth 2 and alternation free for which the ALFP-based development might still work.